

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 November 2000 (02.11.2000)

PCT

(10) International Publication Number
WO 00/65700 A3

(51) International Patent Classification:
5/183, H01L 31/0232, 33/00

H01S 5/40,

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(21) International Application Number: PCT/US00/11048

(22) International Filing Date: 25 April 2000 (25.04.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/300,253 27 April 1999 (27.04.1999) US

(81) Designated States (*national*): AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW.

(84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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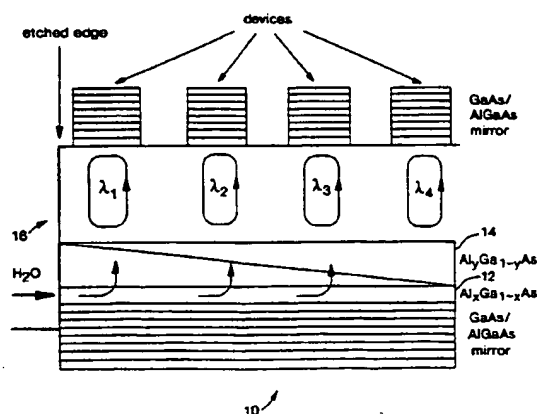
Published:
— With international search report.

(88) Date of publication of the international search report:
18 January 2001

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: POSTGROWTH ADJUSTMENT OF CAVITY SPECTRUM FOR SEMICONDUCTOR LASERS AND DETECTORS



(57) Abstract: A method for selectively tuning the wavelength of optical cavities in semiconductor lasers and detectors after epitaxial growth using lateral wet oxidation. Tuning layers of Al_xGa_{1-x}As and Al_yGa_{1-y}As are positioned inside or adjacent to the optical cavity. Wet lateral oxidation is then used to transform the high-index semiconductor into a low-index oxide for tuning. The oxidation proceeds laterally into the Al_xGa_{1-x}As and then attacks the Al_yGa_{1-y}As layer vertically. The ratios of the oxidation rates can be controlled by adjusting the compositions of the materials, most notably because the oxidation rate increases as the amount of aluminum increases. The oxidized thickness depends on the time that the tuning layer is exposed to vertical oxidation. Due to the change in optical index from the semiconductor to the oxide, the optical thickness and the resonant wavelength of the cavity are also tailored along the lateral oxidation. As a result, the resonant wavelength of a device depends on its distance from the etched edge.

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IPC 7 H01S5/40 H01S5/183 H01L31/0232 H01L33/00

IPC 7 H01S H01L

EPO-Internal, INSPEC, PAJ

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p> FIORE A ET AL: "POSTGROWTH TUNING OF SEMICONDUCTOR VERTICAL CAVITIES FOR MULTIPLE-WAVELENGTH LASER ARRAYS" IEEE JOURNAL OF QUANTUM ELECTRONICS,IEEE INC. NEW YORK,US, vol. 35, no. 4, April 1999 (1999-04), pages 616-622, XP000850971 ISSN: 0018-9197 the whole document </p> <p style="text-align: center;">---</p> <p style="text-align: center;">-/--</p>	<p>1-13, 16-24, 26-46</p> <p>3,14 15,25</p>

☐ Patent family members are listed in annex.

*& document member of the same patent family

Claesson, L

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/11048

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WIPIEJEWSKI T ET AL: "VERTICAL-CAVITY SURFACE-EMITTING LASER DIODES WITH POST-GROWTH WAVELENGTH ADJUSTMENT" IEEE PHOTONICS TECHNOLOGY LETTERS, US, IEEE INC. NEW YORK, vol. 7, no. 7, 1 July 1995 (1995-07-01), pages 727-729, XP000516835 ISSN: 1041-1135	6,7,9, 26,43
Y	the whole document	14
X	CHANG-HASNAIN C: "VERTICAL-CAVITY SURFACE-EMITTING LASERS: 2-D ARRAYS" PROCEEDINGS OF THE OPTICAL FIBER COMMUNICATION CONFERENCE, US, NEW YORK, IEEE, vol. CONF. 15, 2 February 1992 (1992-02-02), page 100 XP000341618 ISBN: 1-55752-222-7	6,7,9,26
Y	the whole document	3
A	FIGORE A ET AL: "LOW-THRESHOLD MULTIPLE-WAVELENGTH VERTICAL-CAVITY LASER ARRAYS OBTAINED BY POSTGROWTH WET OXIDATION" ELECTRONICS LETTERS, GB, IEE STEVENAGE, vol. 34, no. 19, 17 September 1998 (1998-09-17), pages 1857-1858, XP000853427 ISSN: 0013-5194 the whole document	1-46
X	FIGORE A ET AL: "Postgrowth tuning of cavity resonance for multiple-wavelength laser and detector arrays" TECHNICAL DIGEST. SUMMARIES OF PAPERS PRESENTED AT THE CONFERENCE ON LASERS AND ELECTRO-OPTICS. CONFERENCE EDITION. 1998 TECHNICAL DIGEST SERIES, VOL.6 (IEEE CAT. NO.98CH36178), TECHNICAL DIGEST SUMMARIES OF PAPERS PRESENTED AT THE CONFERENCE ON LASE, pages 467-468, XP002150211 1998, Washington, DC, USA, Opt. Soc. America, USA ISBN: 1-55752-339-0 the whole document	1,3,6,7, 9,26,43
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) & JP 09 135051 A (NEC CORP), 20 May 1997 (1997-05-20) abstract.	1-46

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/11048

Patent document cited in Search report	Publication date	Patent family member(s)	Publication date
JP 09135051 A	20-05-1997	JP 2806333 B	30-09-1998
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